the best secularly educated country in the world, and their education policy thoroughly organised.

An interesting comparison of examination statistics in 1906 with those in 1899 is made by Mr. G. F. Daniell in *The School World* for April. Dealing with the results of the matriculation examination of the London University, the article shows that, whereas in 1899, out of 1250 candidates, 842 selected a language and 402 a science "option," 3140 chose a linguistic and 2962 a scientific subject out of a total of 3253 in 1906. In the senior local examinations held by the Cambridge University, the stunted condition of the scientific side shown by the 1899 statistics gives place in 1906 to a more reasonable balance of science and the humanities, and, in the aggregate, the statistics of the junior examination show that science subjects are now receiving fair attention in secondary schools in general. Apparently, however, this cannot be said of the great public schools. Referring to the statistics published by the Oxford and Cambridge Schools' Examination Board, which examines pupils from public and high schools, Mr. Daniell remarks that out of 1027 candidates for the lower certificate of this Board, a total of thirty-four passes in the first class was obtained in the science subjects—of these thirty-four, no fewer than half were in botany, the successful candidates being mostly girls. Among some 2200 candidates for the higher certificate, eighty-three distinctions were obtained in science. It is justly pointed out that "this grudging admission of the claims of experimental science does not satisfy anyone who has realised the importance of educating the nation, especially the upper and middle classes, so that the future may find us not wanting in men of scientific intelligence."

SOCIETIES AND ACADEMIES.

London.

Royal Society, February 14, 1907.—"The Thermomagnetic Analysis of Meteoric and Artificial Nickel-iron Alloys." By S. W. J. **Smith.** Communicated by Sir A. W. Rücker, F.R.S.

As the result of purely magnetic researches, the author comes to the conclusion that a typical octahedral meteorite (containing about 7 per cent. Ni and about 93 per cent. Fe, and exhibiting very regular Widmanstätten figures) consists mainly of an alloy of the two constituents containing about 6½ per cent. Ni. This alloy is kamacite. The thin intervening bands of more nickeliferous material (taenite) are shown in the same way to contain about 27 per cent. Ni, but, further, to be a mixture of nickel-richer and nickel-poorer constituents.

The view most commonly accepted hitherto, as the result of many careful chemical analyses, has been that taenite contains at least 36 per cent. Ni. A critical examination of these analyses shows, however, that they are in accord with the more certain conclusion derived from thermomagnetic data.

In the investigation of a problem of this kind chemical methods lead to ambiguous results, because it is impossible to isolate (from a material like meteoric iron) the secondary constituent (taenite) chemically without fear of partial solution. On the other hand, the taenite can be studied *in situ* by means of the change of its magnetic properties with temperature, because these properties vary in a markedly different way from those of the main constituent kamacite. Thus it can be shown that its properties correspond with those of the artificial 27 per cent. alloy, just as those of the kamacite correspond with those of the artificial 6½ per cent. alloy.

The inference from the experiments that taenite is a eutectic mixture (of coarser structure originally than the artificial 27 per cent. alloy, which is proved also to be a mixture) is shown to be in accord with all that is known concerning nickel-iron alloys, and to afford an adequate conception of the way in which the characteristic structure of meteoric iron has arisen.

The behaviour of "irreversible" nickel-iron alloys during changes of temperature is shown also to be closely analogous to the behaviour of the metastable and labile fluid solutions studied by Prof. Miers.

An explanation is given of the important fact that an artificial nickel-iron alloy containing about 27 per cent. Ni is a "magnetic invar," of which the magnetic quality remains practically constant over a range of about 300° C. after the alloy has been cooled to the temperature of liquid air.

Further development of the thermomagnetic method is to be looked for in cases in which chemical and micrographic methods either fail to remove ambiguity or are inapplicable; meanwhile, if the interpretation of the thermomagnetic data considered is held to be established, a good many doubtful points in the relationship between iron and nickel in their alloys have been made clear.

January 23, 1908.—"Dietetics in Tuberculosis: Principles and Economics." By Dr. N. D. **Bardswell** and J. E. **Chapman.** Communicated by Sir T. Clifford Allbutt, K.C.B., F.R.S.

February 13.—"The Decomposition of Ozone by Heat." By Prof. E. P. **Perman** and R. H. **Greaves.** Communicated by Principal E. H. Griffiths, F.R.S.

The rate of decomposition of ozone has been measured under various conditions, with the following results:—

(1) In a glass vessel the reaction is approximately of the second order.

(2) The relation between the rate of decomposition and temperature may be expressed by the formula log $k = a + bt$.

(3) The rate of decomposition is very largely influenced by the extent of the surface with which the ozone is in contact.

(4) The reaction is of the first order when the ozone is in contact with a porous substance (clay-pipe stems) or some oxides.

(5) Metallic surfaces have but little effect on the decomposition.

(6) Water vapour accelerates the decomposition, and the acceleration is proportional to the amount present.

(7) Nitric oxide greatly accelerates the decomposition.

(8) The rate of decomposition is a linear function of the oxygen pressure. A greater effect is produced by diluting with nitrogen than by simply reducing the pressure of the oxygen.

(9) At 100° the reaction appears to be very slightly reversible.

(10) Finally, the decomposition appears to take place mainly (if not entirely) at the surfaces with which the ozone is in contact, and pressure measurements give no indication of the number of molecules reacting.

Mineralogical Society, March 17.—Prof. H. A. Miers, F.R.S., president, in the chair.—The occurrence of metamorphic minerals in calcareous rocks in the Bodmin and Camelford areas: G. **Barrow** and H. H. **Thomas.** The pneumatolytic action is not contemporaneous with the thermo-metamorphism produced by granite intrusions; the gaseous intrusions are later, and often produce their greatest effect beyond the zone of "contact action." The species of mineral produced depends on the nature of the rock penetrated by the gases. In killas, tourmaline is commonly produced, but in calcareous rocks, axinite and a variety of other minerals result from the pneumatolysis. In the Bodmin area the minerals formed by pneumatolytic action in the calc-flintas are axinite, hedenbergite, epidote, yellow garnet, actinolite, and another amphibole occurring in minute dark-brown needles. In the Camelford area the minerals are mainly due to contact metamorphism. The most conspicuous are yellow garnet, epidote, and idocrase, a mineral which has not hitherto been recorded from Cornwall.—A protractor for use in constructing stereographic and gnomonic projections: A. **Hutchinson.** A short historical account was given of the stereographic projection, and a protractor designed to facilitate its construction was shown. By the aid of this protractor the radii of both great circles and small circles can be readily determined. It can also be applied to the construction of the gnomonic projection, and to measuring the angles between planes and zones.—Supplementary notes on the mineral kaolinite: A. B. **Dick.** Further observations on the optical characters of kaolinite from Anglesea lead to some alterations in the data given in a previous paper. The refractive index is about 1·563 for sodium light, and the optic axial angle, 2V, is about 68° instead of 90°. The double refraction is very low. Kaolinite from limestone at Hambleton Quarry, Bolton Abbey, Yorkshire, and from sandstone near Newcastle-on-Tyne were described.—An attachment to the goniometer for the measurement of complex lamellated crystals: H. L. **Bowman.** The apparatus, consisting of a small screen pierced by a pin-hole, can be attached to a goniometer, and is capable of adjustment so that minute portions of a crystal face can be successively illuminated.—A new form of quartz-wedge, a modification of the Wright-wedge: J. W. **Evans.** A quartz-wedge cut parallel to c is placed over a gypsum-plate parallel to a showing red of the first order, and extending beyond the thin end of the wedge, so that the projecting portions can be used as an ordinary gypsum-plate. The region where the wedge overlies the gypsum is graduated at the position of exact compensation, and at each thousand micromillimetres of relative retardation. If, when placed over a mineral in the diagonal position, the black band is moved towards the thin end of the wedge, the direction of insertion is that of the vibrations which traverse the mineral with the smaller velocity; if towards the thick end, the direction is that corresponding to the greater velocity.—Calculation of the chance that the double refraction of a crystal section cut at random shall exceed a particular fraction of the maximum: H. **Hilton.** The problem is soluble completely for a uniaxial, and partially for a biaxial, crystal.

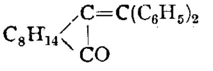
Physical Society, March 27.—Dr. Charles Chree, F.R.S., president, in the chair.—Notes on the plug permeameter: Dr. C. V. **Drysdale.** In the instrument a drill is employed to cut a conical hole in a casting or forging, leaving a pin one-tenth inch diameter standing in the middle. A wrought-iron plug carrying a bobbin with magnetising and search coils completes the magnetic circuit, forming a miniature permeameter. Investigations have been made showing that the amount of the end effect can be compensated by correcting the value of H in the same ratio for all specimens. Curves were given showing the results obtained by the plug permeameter when the instrument had been empirically calibrated.—The use of shunts and transformers with alternate current measuring instruments: Dr. C. V. **Drysdale.** The paper deals mathematically and experimentally with errors in the magnitude and phase of the current. With shunts, the condition for accuracy at all frequencies is that the time constants of the instrument and shunt should be equal. For current transformers the best results are obtained by keeping the magnetising and core-loss currents as small as possible.—Dynamometer wattmeters: Dr. C. V. **Drysdale.** An investigation of the theory of the wattmeter, including the effects of shunt inductance and capacity, mutual inductance, eddy currents, wave-form and of iron. It is pointed out that the theory of the wattmeter is much obscured by the use of the correction factor. The correction of a wattmeter should be applied as a difference, and not as a ratio. A description of single and double forms of standard wattmeter and of deflectional wattmeters containing iron was given.

Institution of Mining and Metallurgy, April 9.—Mr. Bedford McNeill, vice-president, in the chair.—The electrical equipment of gold mines: H. J. S. **Heather.** A review of the present application and future possibilities of the application of electric power to mining operations, with practical notes of installations that have been made under the author's supervision. He points out the relative advantages or otherwise of the continuous and alternating current systems for the purposes of gold-mining work.—Addendum to paper on earth temperatures on Witwatersrand gold fields: Hugh F. **Marriott.** A matter dealt with in a previous paper by the same author centred round the mean earth temperatures at the surface in the vicinity of the Rand. This addendum records subsequent investigations tending to settle the point in dispute in connection with the attempt to establish a rule for the average increase of temperature with depth.—The carat weight: E. J. **Vallentine.** A concise account of the origin and present position of the carat weight as used by dealers in gold and precious stones, with records of the steps taken to establish a standard metric carat for universal adoption.—An electromagnet for testing the suitability of an ore for magnetic separation: L. H. L. **Huddart.** A description of a hand apparatus designed by the author for use abroad. It is suitable for the quantitative determination of the separation to be expected in treating a given ore by means of a powerful magnet.—The gold alluvials of the river Drau in Hungary: A. **von Gernet.** A brief account of the subject of the title, with comparisons of the relative efficacy for determining values obtained by panning small samples and counting "colours."

Royal Astronomical Society, April 10.—Mr. H. F. Newall, F.R.S., president, in the chair.—Description of a 24-inch long-focus cœlostat reflector: J. H. **Reynolds.** The instrument has been constructed for use in spectroheliographic work, but is also arranged for taking celestial photographs. The focal length is 38 feet, and the diameter of the plane mirror of the cœlostat 28 inches. Specimens of photographs taken with the instrument were shown on the screen.—Dr. A. W. Roberts's method of determining the absolute dimensions of an Algol variable star: Rev. J. **Stein.** Dr. Roberts had attempted to deduce from the light curve of such a variable the dimensions of the orbits of its components, but Mr. Stein showed that it is theoretically impossible to determine the absolute dimensions of the orbit in this manner.—Note on the newly discovered eighth satellite of Jupiter: **Astronomer Royal.** The moving object near Jupiter, found by Mr. Melotte upon photographs taken at the Royal Observatory, had been again photographed on March 27, 31, and April 3. It had also been photographed by Dr. Max Wolf at Heidelberg and at the Lick Observatory. It now appeared that the new object is a satellite of Jupiter, much more distant from the planet than the sixth or seventh satellites.—First approximation to the orbit of J. VIII.: A. C. D. **Crommelin.** The hypothesis of retrograde motion for the new satellite appeared at present most probable; from the preliminary elements obtained the sidereal period would probably be between three and four years, and the distance from the planet about three times that of Satellite VII.—Variable-star work at Rousdon Observatory: C. **Grover.**—A new "spanner" sextant: Captain **Gadsden.** The arrangement consisted of an attachment to a sextant to enable observations to be made when the horizon is obscured or hazy.—Note on the conditions for the passage of the earth through the plane of Saturn's ring: H. H. **Turner.** The late Mr. Proctor had given a general account of the manner in which the earth may pass through the plane of the ring, either once or three times at each favourable opportunity. The present paper gives the explanation in a more compact and complete form.—Retrogradation of the sun's shadow: M. E. J. **Gheury.**—Series of photographs of the Milky Way taken with a small lens of $5\frac{1}{3}$ inches focal length: Dr. Max **Wolf.**—Experiment illustrating the gradually increasing red colour of the sun as it approaches the horizon at sunset: S. L. **Fletcher.**

PARIS.

Academy of Sciences, April 6.—M. H. Becquerel in the chair.—An isomer of diphenylcamphomethane and the conditions of its formation: A. **Haller** and E. **Bauer.** Details are given of the best method of reducing



$$C_8H_{14}\begin{cases} C{=}C(C_6H_5)_2 \\ \quad | \\ CO \end{cases}$$

in alkaline solution. The substance obtained, diphenylcamphomethane, is isomeric with the substance obtained by carrying out the reduction in acid solution, and can be obtained from the latter by boiling with alcoholic potash, and in other ways. Various attempts have been made to elucidate the constitutions of these two isomers, but hitherto without success.—A new mineral species from the French Congo: A. **Lacroix.** The new mineral is a silicate of copper, differing from dioptase in being attacked with difficulty by acids, and in its composition,

$$Si_{12}O_{44}Cu_{15}H_{10} \text{ or } 12SiO_2.15CuO,5H_2O.$$

The name plancheite is proposed for the mineral.—The perception of relief and of depth in the simple image of ordinary photographs. Conditions and theory of this perception: A. **Chauveau.** By a suitable adjustment of the prisms of a stereoscope, the effect of relief can be obtained from a single photograph just as well as if the latter were replaced by the usual double stereoscopic photograph. The effect can be produced without any apparatus; the examination with one eye alone of a well-lighted photograph after some time causes the stereoscopic effect. To reduce this to the usual plane effect the other eye is required. The theory of these phenomena is considered in detail.—The acceleration and retardation of the coagulation of the blood in capillary tubes: Ch. **Bouchard.**—The Coal-measures of the southern Oran: H. **Douvillé** and M. **Zeiller.** A detailed description of the fossils met with is given, and the analogy with the Carboniferous deposits in England pointed out. This is the first time that a Westphalian flora has been discovered in such a low latitude.—The subgroups of the homogeneous linear group of four variables, and the systems of partial differential equations which correspond to them: M. **Le Vavasseur.**—The persistent conjugate networks comprising a family of minimum lines: L. **Raffy.**—The maximum useful weight that can be raised by an aëroplane: M. **Girardville.** It is shown that the maximum useful weight carried by an aëroplane depends upon five variables, and possibilities of improvement may be sought for in modifying each of these.—The conditions of utilisation of balloons capable of being steered, as existing at present: M. **Bouttieaux.** An account of modifications introduced with the view of economising ballast.—The spectroscopic study of flame of various kinds: G. A. **Hemsalech** and C. **de Watteville.** The method of feeding a flame with particles of metal obtained electrically, described in an earlier paper, has been applied to flames of hydrogen alone, coal gas and oxygen, hydrogen and air, and hydrogen and oxygen. Details of the results obtained with the pure hydrogen flame are given in the present communication.—The presence of spark lines in the arc spectrum: Ch. **Fabry** and H. **Buisson.** All the spark lines (the enhanced lines of Lockyer) are emitted in the arc spectrum of iron, but only by certain portions of the arc. Similar effects have been obtained with nickel and copper.—A new method of estimating the vapour of mercury in air: P. **Ménière.** The air is aspirated through boiling nitric acid in a special apparatus figured, and the minute proportions of nitrate of mercury treated with diphenylcarbazide. This gives distinctive colours in proportions of mercury varying from 1/100,000 to 1/5,000,000. The paper is accompanied by a plate showing twelve gradations of tint obtainable.—The combustion by incandescence of gases in presence of oxidisable and incombustible bodies: Jean **Meunier.**—The variations of composition of ammonium phosphomolybdate: application to the estimation of phosphorus in iron and steel: G. **Chesneau.** The author regards a double precipitation as absolutely necessary if the precipitate is to have a constant composition, and gives detailed instructions for carrying out the process.—The ammoniacal chlorides of dimercuriammonium: H. **Gaudechon.**—Arbutine and some of its derivatives considered from the point of view of their rotatory power and their hydrolysis by emulsin: Em. **Bourquelot** and H. **Hérissey.**—Comparative study of the dehydration of atrolactic and *p*-methoxyatrolactic acids. *p*-Methoxyatropic and di-*p*-methoxyatropic acids: J. **Bougault.**—The formation of mixtures of isomers of constant melting point in the Friedel and Crafts reaction: G. **Perrier** and H. **Caille.** The product obtained in the preparation of phenylnaphthylketone by the Friedel and Crafts reaction had a definite melting point, which was unchanged after several re-crystallisations. It was shown, however to consist of a mixture of the α and β isomers.—The constitution of the membrane in diatoms: L. **Mangin.**—The action of the hygrometric state in respiratory exchanges: J. **Cluzet.**—The action of the alcoholic extract of normal human urine on the arterial pressure: J. E. **Abelous** and E. **Bardier.**—The possible effects of carbon monoxide in poisoning by tobacco smoke: C. **Fleig.** The conclusion is drawn that the amounts of carbon monoxide given off during the smoking of tobacco can contribute nothing to the effects of tobacco poisoning.—The action of brewers' yeast on the amido-acids: J. **Effront.**—Some artificial peroxydiastases: the important part played by iron in their action: J. **Wolff.**—The formation of acetaldehyde in alcoholic fermentation: E. **Kayser** and A. **Demolon.** The conclusion relating to the origin of acetaldehyde in alcoholic fermentation, described in a recent note by M. Trillat, confirms the conclusions published by the authors a year ago.—The preparation and properties of crystallised oxyhæmocyanine from the snail: Ch. **Déré.**—Bile and the biliary pigments: M. **Piettre.**—The canine origin of *kala-azar*: Charles **Nicolle** and Charles **Comte.**—The *rôle* of positive torsion in propulsive screws and aëroplanes: P. **Amans.**—The variations of temperature of the spring of Sainte-Baume (Var): E. A. **Martel.** Another instance of the variation in temperature of springs. The spring described has on numerous previous occasions shown a temperature of 10°·5 C.; in October, 1907, after an exceptionally rainy month, the temperature rose to 13° C.

PRETORIA.

Transvaal Biological Society, January 17.—Dr. Theiler, C.M.G., in the chair.—A new species of tick found in the Transvaal: Mr. **Howard.**—Viscosity of blood: Dr. **Frei.**—Demonstration of a diseased skull of *Papio porcarus* (Bodd): Dr. **Gunning.**—Demonstration of some stages in the life-history of *Strongulus contortus*, Rud: Dr. **Gough.**—Further transmission experiments with East Coast fever: Dr. **Theiler.**—(1) Some additions to the Transvaal flora; (2) new plant species from the Transvaal and Swaziland; (3) notes on drabok poisoning; (4) the application of Mendel's law of heredity in the breeding of maize: Mr. **Burtt-Davy.**

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